

Attachment 5 Work Plan

The specific goals for this project are to investigate the status of the Santa Margarita Sandstone beneath the chosen site. The Santa Margarita Sandstone is believed to occur beginning at ~850 feet below grade. If the entire sequence is present, it should be about 220 feet thick. The basal unit of the sandstone is the most permeable and is of the most interest to MPWMD because its presence will mean the expansion of ASR is viable at this site. MPWMD will drill a borehole down to the top of the Monterey Shale and evaluate the occurrence of the sandstone beneath the site.

Figure 5.1 illustrates the decision process for the project and outlines the two outcomes. Both of the outcomes provide progress toward meeting the objectives in the Seaside Adjudication Decision. This monitor well is a requirement for the operation of the ASR Program. The ASR program allows Cal Am to physically replace overdrawn groundwater in the Seaside Basin. This process is outlined in the adjudication decision as replenishment water.

Below is a narrated work plan by scope task;

1. Request for bids – MPWMD staff will prepare a request for bids to drill and construct a clustered monitor well at the proposed location. Sealed proposals will be accepted for 2 weeks and opened at bid close. The lowest qualified bidder will be selected. MPWMD will enter into a contract for services and supervise contract activities. In order to qualify, bidders shall hold a valid Class C-57 California Contractor's License. Concurrent with the bid submittal, the contractor will submit a list of wells he has constructed that measure at least 1,100 feet in depth and which are of similar diameter and design as the well to be constructed for MPWMD. The list shall include the construction dates of these wells. The well will be drilled by the reverse-rotary drilling method with drilling equipment of sufficient capacity to drill the holes required by these specifications to a depth of approximately 1,100 feet. All drilling equipment including mast and drawworks, air compressors, drilling fluid pumps, drill pipe, etc., must be of requisite size, sufficient capacity, and suitable condition to drill and set casing to the anticipated depths. The drill rig utilized must have the ability to fully lift and land the anticipated casing loads without the use of float plugs or other similar methods. All drill pipe must utilize threaded flush or upset tool joints, or flanged pipe, or equal, as approved by the Owner's Technical Representative (Geologist).
2. Permitting – MPWMD will begin permitting on a parallel track as the bidding process as to have the permits in hand to allow the selected contractor to mobilize immediately. Required permits are Monterey Environmental Health Department Well Drilling permit and the City of Seaside Use permit. MPWMD will prepare a CEQA notice of exemption to cover the construction activities. MPWMD has obtained these permits in the past and these are largely ministerial tasks
3. Mobilization – Upon receiving the notice to proceed from MPWMD, the contractor will coordinate with MPWMD and mobilize equipment to the drill site. Mobilization shall

consist of all preparatory work and materials necessary for construction operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; control of water; site leveling; and all other facilities necessary for work on the project and for all other work and operations which must be performed or cost incurred prior to beginning work on the various Contract items on the project site. The project location and the well site are shown on the detailed site map.

The Contractor shall provide a complete drilling unit, all tools, accessories, power, fuel, materials, supplies, lighting, and other equipment and experienced personnel necessary to conduct efficient drilling operations. The drilling unit shall be in good condition and of such capacity as to drill the hole and complete a well as required by these Specifications to a depth of approximately 1,100 feet.

The project site is located near a residential neighborhood. In order to limit lighting impacts to nearby residences during night-time operations, the Contractor shall take any and all measures necessary to prevent lighting from shining outside the work-site perimeter.

The Contractor shall be responsible for immediate cleanup/removal of any dirt tracked onto the city streets.

The project site is located in a sensitive, urbanized area. Accordingly, the City of Seaside will require erection of a temporary noise relief structure around the work site.

The reduction of noise pollution shall also consist of providing construction equipment and performing construction activities in a manner that minimizes noise generation and conforms to these Specifications. It shall be the Contractor's responsibility to keep noise pollution due to construction activities as low as possible. In no case shall noise levels produced by the Contractor exceed the city of Seaside's adopted exterior noise standard of 70 decibels at nearby residential receptor locations.

Night-Time Operations: City of Seaside permit conditions restrict all noise generating construction activities to weekdays between 7 AM and 7 PM, and 9 AM to 5 PM on Weekends. One exception to the above restriction shall allow one continuous 24-hour construction period (if necessary) during well construction. In the event that a continuous 24-hour construction period is needed, the Contractor shall notify the District at least one day in advance so that overnight accommodations can be arranged for any nearby residents requesting relief from the construction noise.

4. Drill and Construct Deep Completion and Collect Geophysical Log - Drilling operations are anticipated to begin in August 2013. The project's construction time is estimated to be 30 calendar days.

The following requirements will be included in the contractor's contract and be strictly adhered to during well drilling and construction;

- It is understood that the Contractor will anticipate any adverse weather conditions and will take the necessary measures to ensure that work will progress to the completion of the project. In addition to the work described the Contractor will be responsible

for other work that will be required during the construction of the well. The Contractor shall prepare the site in a manner as to provide adequate work space, safe working conditions, and sufficient containment and storage of drilling cuttings and fluids.

- The Contractor shall convey all water produced from the well during the final stages of development and during the production testing through closed pipe to a storm drain approximately 250 feet south of the well site. Proper precautions shall be taken to prevent erosion or damage to the well site or nearby roads as the result of discharge.
- Drilling cuttings and mud are to be removed from the site, unless an alternate disposal method is approved by MPWMD. Water supply for well drilling and construction will be made available at no cost to MPWMD. The Contractor is responsible for conveyance of water to point of use, which is approximately 500 feet from the well site.
- The Contractor shall furnish and provide all work, equipment, and materials necessary to complete the drilling one 8 1/4 inch-diameter bore (minimum diameter) at the well site one to a depth 1,100 feet below ground surface.
- The Contractor must use the drilling method and fluids consistent with his/her bid and follow the proposed drilling fluid program outlined in the bid. Data regarding the types of fluid used, drilling fluid weights, viscosities, sand and solids contents, water loss control, and the name of the drilling fluid will be logged throughout drilling. Drilling with clear water alone will not be permitted.
- Fresh water shall be used to make up drilling fluids. The drilling fluid shall possess such characteristics as are required to adequately maintain the walls of the hole to prevent caving of the hole as drilling progresses and to permit recovery of representative samples of cuttings. The drilling fluid shall possess such characteristics that it can be readily removed from the hole during the placement of the gravel pack and during development of the well. The drilling fluid may be a polymer system such as Poly-Bore, Aquapak, HEC, Drispac, Duel-Vis, or a clay-based bentonite system, providing the properties specified below can be maintained to the satisfaction of the Geologist. The Contractor is advised that excessive water loss can lead to swelling, loss of shear strength, substantial caving, and hole stability problems. The drilling fluid to be utilized shall contain properties to inhibit this possibility.
- Proper control of the drilling fluid must be maintained to the satisfaction of MPWMD, and the Contractor may be required, at his own expense, to retain or employ an experienced, qualified Mud Engineer, acceptable to MPWMD, who may be required by MPWMD to be present on the job to supervise and maintain drilling fluid characteristics to the satisfaction of MPWMD. These requirements are;

- The Contractor must provide at the drilling site at all times Standard API measurement devices in proper working order to determine the following drilling fluid properties:

Drilling fluid weight

Drilling fluid viscosity

Drilling fluid sand content

30 minute water loss/filter cake (not applicable for polymer based fluid systems).

The above properties of the drilling fluid entering the mud pump or leaving the circulation tank must be recorded by the contractor at a minimum of 4-hour intervals. The Geologist may also periodically measure drilling fluid properties. The drilling fluid shall have the following properties in accordance with API Code RP 13B (or recent modification) "Recommended Standard Procedures for Testing Drilling Fluids."

For **clay-based bentonite** fluid systems, the following properties shall be maintained.

1. Weight - a maximum of 9.5 pounds per gallon during all aspects of drilling.
2. Marsh Funnel Viscosity – a minimum of 38 seconds and a maximum of 50 seconds during all aspects of drilling.
3. Sand Content - a maximum of two percent by volume during all aspects of drilling.
4. Water Loss - a maximum of 20 cc during pilot hole drilling. During pilot hole reaming, a maximum of 15 cc. Wall cake thickness shall be no greater than 3/32-inch.

For **polymer based** fluid systems, the following properties shall be maintained.

1. Weight - a maximum of 9.0 pounds per gallon during all aspects of drilling.
 2. Marsh Funnel Viscosity – a minimum of 38 seconds during all aspects of drilling (no maximum).
 3. Sand Content - a maximum of one percent by volume during all aspects of drilling (special note: this testing procedure shall include the addition of sodium hypochlorite to the test sample in order to destroy the polymer).
- Excavation of pits on-site for drilling fluids will not be allowed, and surface containment (i.e., tanks and/or bins) of drilling fluids will be required. Cuttings from shaker or those removed from tanks will be stored and contained on-site. Contractor may choose to utilize "low-boy" bins for cuttings storage.
 - For clay-based bentonite fluid systems, mechanical separation must be utilized to remove all but the finest of drill cuttings from the drilling fluid. Mechanical separation shall include, at a minimum, a shale shaker and desanders capable of handling a minimum of 125 percent of the circulating capacity of the fluid system.

This equipment must keep sand content below two percent in the drilling fluid at all times during the drilling process.

- For polymeric fluid systems without mechanical separation, the Contractor must have a minimum of two separate tanks connected in series and internally baffled to effectively settle and remove solids from the fluid prior to recirculation down the borehole. The tanks shall have a minimum combined capacity equal to the volume of the reamed hole to provide adequate retention time of the fluid at the surface to allow effective settling of solids. The Contractor shall maintain tank capacity throughout the drilling process by routinely removing cuttings from the settling tanks. The Contractor shall submit for review and approval of the Geologist the layout and configuration of the fluid system.
- It is the Contractor's sole responsibility to ensure that the sizing and configuration of the fluid system and settling tanks are adequate to meet the drilling fluid properties outlined below. If drilling fluid properties as outlined below are not met, the Contractor will be issued a warning of noncompliance by the Geologist. Failure to meet the specified conditions may result in the suspension of further drilling until fluid properties are brought within specifications and pit capacity and configuration is corrected to the satisfaction of MPWMD.
- The methods and materials that the Contractor would utilize in the event of hole stability problems and/or loss of circulation must be approved by MPWMD. Addition of unapproved materials to the drill hole or fluid system may be cause for rejection of the well.
- The Contractor must keep records providing the following information for the well:
 1. A log of drilling bit types and depths at which drill bit changes are made.
 2. A log of the cuttings, providing the depths and descriptions of the earth materials encountered during the pilot boring. The Contractor shall collect cutting samples at 10-foot intervals during the drilling of the pilot boring. Samples shall be placed in "zip-lock" plastic bags and labeled with well name, sample depth interval, and date.
- All measurements for depths shall be referenced to existing ground surface at the well site. All drilling records shall be delivered to the Geologist upon completion of the well.
- Upon completion of the pilot bore, a geophysical log of the bore hole will be conducted. The geophysical log will be used to develop the final design elements of the well. MPWMD may authorize additional pilot boring upon review of the geophysical log.
- The Contractor shall furnish services for geophysically logging the deep pilot hole. Borehole geophysical logs, consisting of spontaneous potential, 16- and 64-inch

resistivity surveys, and a natural gamma survey, all in API format, shall be made of the pilot bore by the Contractor as directed by MPWMD. Standby time will not be paid for additional cleaning and conditioning of the hole to enable logging operations to proceed.

- Construction of the well - The blank well casing shall be of 4-inch-diameter Schedule 80 PVC flush threaded pipe in accordance with ASTM F480. The perforated well screen shall be 4-inch-diameter Schedule 80 and 2-inch-diameter Schedule 40 PVC flush threaded pipe in accordance with ASTM F480, horizontal factory slotted casing. Slot size shall be 0.040 inches. Installation shall include applying PVC cement to the male threads prior to assembly of each joint. All field joints shall be primed and glued in strict accordance with IAPMO standards. Joints shall include installation of set screws if required by the Geologist. Waterproof quick-drying PVC cement shall be used. As joints are made up, the tube shall be lowered into the well. Assembly and installation of well casing shall be such as to insure watertight joints and that unperforated casing is watertight throughout its entire length.
- Upon completion of reaming the bores, the Contractor shall install the well screen and casing at intervals as determined by MPWMD.
- The bottom of the well casing shall be fitted with an approved cap. Casing shall be placed by approved methods in a manner that will insure no damage to the casing during installation. Suitable approved spring steel guides or centralizers shall be provided in order to center and hold the casing pipe in its proper position until the gravel envelope is in place, spaced at not greater than 75 feet on centers, along the casing length. Individual guides in successive groups shall be oriented so as to be in vertical alignment with the guides above and below. The casing shall be suspended in tension from the surface by means of appropriate hangers or clamps. The use of float plugs to land and set the casing will not be permitted. The bottom of each casing shall be a minimum distance of 5 feet above the bottom of the well hole to insure that none of the casing weight will be supported from below. All casing material shall be new. If, for any reason, the casing cannot be landed in the correct position or at a depth acceptable to MPWMD, or any of the casings should collapse prior to well completion, the Contractor shall construct another well immediately adjacent to the original location and complete this well in accordance with the specifications at no additional cost to the District. The abandoned hole shall be sealed in accordance with directions from the District and in accordance with any laws pertaining to proper well destruction.
- The Contractor shall furnish all equipment, material and work necessary to install gravel or coarse-grained sand, as shown on the Drawings and as specified by MPWMD and herein.

- All gravel or coarse-grained sand for packing shall be hard, water worn, and washed clean of silt, fine sand, clay, and foreign matter. Crushed gravel will not be accepted. Gravel pack materials shall be rounded to well-rounded with a moderate to high sphericity and graded. Not more than three percent, by weight, of the gravel shall be flat or elongated. Gravel shall be of the type or equivalent to Ogleybay Norton/Colorado Silica Sand, Inc., and subject to the approval of the Geologist prior to delivery. Gravel pack materials shall meet AWWA-B100-89 standards, and the following specifications. An 8 x 16 gradation shall be used and the materials graded within the following limits:

<u>U.S. STD. Sieve</u>	<u>Percent Passing</u>
6	100
8	90 - 100
10	65 - 95
12	15 - 65
14	2 - 20
16	0 - 5

- Prior to the placement of the gravel pack, the drilling fluid shall be thinned with clean water to the satisfaction of the Geologist. Gravel shall be placed by pumping through a removable gravel feed line extending to the bottom of the well. The use of water and gravel pump shall be required. As gravel placement progresses, the gravel feed line shall be gradually withdrawn. As the gravel pack settles, more gravel shall be added. When placing the gravel in the annular space, a suitable device or method approved by the Geologist shall be used in determining the gravel level and to calculate the quantity of gravel placed.
- When no further settlement of the gravel occurs, the remaining annular space opposite the upper blank casing shall be filled with grout with properties as specified above. Cement grout material shall be placed by the positive displacement pumping method. A grout pipe shall extend from the surface to the bottom of the zone to be grouted. The grout pipe may be slowly raised as the grout is placed, but the discharge end of the grout pipe must be submerged in the emplaced grout at all times until the grouting of the entire specified zone is completed. The grout pipe shall be maintained full, to the surface, at all times until the completion of the grouting of the entire specified zone. When completed, grout or concrete shall be visible at the surface of the ground outside the casing

5. Install Pump in deep completion

- Contractor will supply and install the following items in the deep completion. All work will be supervised by MPWMD and is subject to approval to be deemed complete.
- One GFSQ10-410-2 3" submersible pump and motor.
- One 1 HP control box

- 1000' 8-3 Flat jacketed submersible cable
- 1000' 1' schedule 120 deep set pipe
- Forty seven 1" SS couplings
- Four 1" SS check valves
- One splice kit
- One 4" well seal
- 1000' of 1/4 " SS cable
- 500' of 1" flush threaded sounding tube

6. Drill and Construct Shallow Completion

- All requirements for drilling operations outlined in task 4 apply to task 5 with the exception of the casing material.
- Construction of the well - The blank well casing shall be 2-inch-diameter Schedule 40 PVC flush threaded pipe in accordance with ASTM F480. The perforated well screen shall be 2-inch-diameter Schedule 40 PVC flush threaded pipe in accordance with ASTM F480, horizontal factory slotted casing. Slot size shall be 0.040 inches. Installation shall include applying PVC cement to the male threads prior to assembly of each joint. All field joints shall be primed and glued in strict accordance with IAPMO standards. Joints shall include installation of set screws if required by the Geologist. Waterproof quick-drying PVC cement shall be used. As joints are made up, the tube shall be lowered into the well. Assembly and installation of well casing shall be such as to insure watertight joints and that unperforated casing is watertight throughout its entire length.

7. Install Water Level Logging Equipment

- MPWMD staff will place an order from Insitu Inc. for;
 - Two Level Logger 700 pressure transducers
 - Two Rugged Cables, and
 - One Rugged Reader
- Upon receipt of level logging equipment, MPWMD will install the Level Loggers and suspend them on the rugged cables. The Level logger deployed in the Deep Completion will be installed in the 1" sounding tube.

- MPWMD will program the loggers to record water level elevations every hour on the hour.

8. Collect Water Quality Sample From Deep Completion

- Following development and installation of the pump and level logger in the deep completion, MPWMD will sample the well.
- MPWMD will use a 220V Honda generator to supply power to the pump motor.
- Three casing volumes will be evacuated prior to sampling. This volume will be calculated by taking a water level prior to beginning pumping and using 0.653 factor for gallons per foot of depth in the well. Pumping rate will be measured by a water flow meter placed on the flush line.
- Field parameters of pH, temperature, dissolved oxygen, ORP, TDS, and hydrogen sulfide concentration will be measured prior to sampling and after three well volumes have been purged from the well. A flow cell will be used and flushing rate will be reduced to 0.2 GPM to achieve the ideal conditions to measure ORP.
- Samples will be collected in pretreated sample bottles and transported to the lab in a cooler under a chain of custody.
- Samples will be analyzed for the full suite of parameters included in the SAP. This includes all of the constituents outlined in the G1, S1, and DBP panels.

9. Site Cleanup

- Contractor will return the site to pre-construction conditions. Representatives from City of Seaside and Monterey Peninsula Unified School District will be allowed to tour the site and give their approval before MPWMD signs off on this task.

10. Analyze Geophysical Log and Evaluate the Feasibility of Aquifer for Expansion of ASR Program.

- MPWMD will evaluate the presence, thickness and inferred aquifer parameters of the Santa Margarita Sandstone.
- The newly collected geophysical log will be overlain by logs of ASR wells 1,2, and 3. If the resistivity curves show a similar shape, the site will be deemed feasible for expansion of ASR. Exhibit 5.1 is the geophysical log collected from the Seaside Middle School Monitor well located approximately ¼ mile to the south and east. The large response of resistivity (70 Ohm²/M) and gamma (180 api) beginning at 870 feet below the surface is indicative of the Santa Margarita Sandstone. Spinner logs taken in actively injecting well show this strata is the highest hydraulic conductivity of the entire sequence. This is the signature MPWMD is hoping to measure with the geophysical log. However if the curves are not similar and the resistivity and gamma curves show there is a fining of the sandstone in this locality, the site will not be considered feasible.

- Cuttings will also be used to verify the geophysical log interpretations. The sequence beginning at 870 is primarily quartzite with a decreasing amount of hornblende present in drilling returns. If these two trends are found MPWMD will move forward with implementation of Phase 3 of the ASR program at this location.

11. Final Report

- MPWMD will prepare and submit a final report outlining the drilling and construction of the well, the geophysical log, field notes, pictures of final site conditions, water quality sample results, and the conclusion as to if the site is feasible for ASR expansion. MPWMD will outline it's line of reasoning and scientific method behind the decision. If the site is found to be feasible MPWMD will expand on the next steps for ASR expansion. If the site is not feasible, MPWMD will incorporate the well into the ASR monitoring network as the far field monitoring well. If this is the case MPWMD will cc DWR on the final correspondence with the RWQCB.

Miscellaneous Information	
1. Name of the person(s) who prepared this report:	
2. Date of the report:	
3. Name of the person(s) who reviewed this report:	
4. Date of the review:	
5. Name of the person(s) who approved this report:	
6. Date of the approval:	
7. Name of the person(s) who signed this report:	
8. Date of the signature:	
9. Name of the person(s) who filed this report:	
10. Date of the filing:	

A recreational GPS accurate to +/- 45 feet set for Datum NAD27 was used to calculate Latitude, Longitude & Elevation values. The Section, Township, and Range then determined using the TRS program (TRS accuracy is not guaranteed). The TRS program converts Latitude and Longitude to Section, Township, and Range. The NOTICE at the bottom of this heading also applies.

NOTICE

All interpretations are opinions based on inferences from electrical and other measurements and we do not guarantee the accuracy or correctness of any verbal or written interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by one of our officers, agents or employees. These interpretations are also subject to our General Terms and Conditions as set out in our current Price Schedule.

welenco, inc. October 14, 2009













